

HCF - LCM - PRIME FACTORIZATION

EXPRESS 168 AND 140 AS PRODUCT OF ITS

(2,3,5,7,...)
only for
prime

PRIME FACTORS

2	168
2	84
2	42
3	21
7	7
	1

2	140
2	70
5	35
7	7
	1

$$168 = 2 \times 2 \times 2 \times 3 \times 7$$

$$140 = 2 \times 2 \times 5 \times 7$$

Q: Find HCF & LCM OF 168 and 140.

$$\text{HCF: (Loop only)} = 2 \times 2 \times 7 = 28$$

LCM: (Loops and discs)

$$= 2 \times 2 \times 7 \times 2 \times 3 \times 5$$

$$\text{LCM} = 840$$

i) Find Smallest integer n such that

168n is multiple of 140.

$$\frac{168n}{140} = \frac{(2 \times 2 \times 2 \times 3 \times \cancel{7})}{2 \times 2 \times 5 \times \cancel{7}} \rightarrow 5$$

$$n = 5$$

Concept:-

12 is multiple of 4

True

$\frac{12}{4} = 3$ If all denominator cuts
it means 12 is multiple
of 4.

ii) Find Smallest integer n such that

140n is multiple of 168.

$$\frac{140n}{168} = \frac{(2 \times 2 \times 5 \times \cancel{7})}{\cancel{2} \times \cancel{2} \times 2 \times 3 \times \cancel{7}} \rightarrow 2 \times 3$$

$$n = 2 \times 3$$

$$n = 6$$

(iii) Find smallest integer k such that

$168k$ is a perfect square.

→ Factors of a square number always live in pairs.

$$168 = 2 \times 2 \times 2 \times 3 \times 7$$

$$168k = (2 \times 2 \times 2 \times 3 \times 7) \boxed{2 \times 3 \times 7}$$

$$n = 2 \times 3 \times 7 = \boxed{42}$$

(iv) Find smallest integer k such that

$168k$ is a perfect cube

→ Factors of a cube number always live as triplets.

$$168 = 2 \times 2 \times 2 \times 3 \times 7$$

$$168k = (\underbrace{2 \times 2 \times 2}_{\text{triplet}} \times 3 \times 7) \boxed{3 \ 3 \ 7 \ 7}$$

$$k = 3 \times 3 \times 7 \times 7 = \boxed{441}$$

V.IMP

ADVANCED:

Q. It is given that HCF of $96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ and another number N is $2^3 \times 3$. Given that N is less than 96 , Find greatest value of N . (1 mark)

$$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$N = \boxed{2 \ 2 \ 2 \ 3} \times 3 = 72$$

$$\text{HCF} = 2 \times 2 \times 2 \times 3$$

New No. Conditions

1- Prime

2- No new loop

3- Within Limit

$$\boxed{N = 2 \times 2 \times 2 \times 3 \times 3 = 72}$$

When HCF is given

ALWAYS GREATEST VALUE

- 1) Copy whole HCF to box of N
- 2) Now multiply new prime values in box of N and New values must not make a new loop. The total should not exceed range given in question.

Q. Given that LCM of $A = 2^2 \times 5^2 \times 7$ and another number N, is $2^2 \times 3 \times 5^3 \times 7$. Find the Least value of N.

$$\begin{aligned} A &= 2 \times 2 \times 5 \times 5 \times 7 \\ N &= \begin{array}{|c|c|c|c|c|} \hline \text{No} & \text{Two} & 3 & 5 & 5 & 5 & \text{No} & \text{Seven} \\ \hline \end{array} = 3 \times 5 \times 5 \times 5 = 375 \\ \text{LCM} &= 2 \times 2 \times 3 \times 5 \times 5 \times 5 \times 7 \end{aligned}$$

LCM GIVEN: LEAST VALUE.

Note: 1) If the number of factors are same in A and LCM, ignore these in N.

2) If the no of factors in A and LCM are different, copy the no of factors from LCM to N.

(b) The lowest common multiple of $\underbrace{2^2 \times 5^2 \times 7}_A$ and another number, N , is $\underbrace{2^2 \times 3 \times 5^2 \times 7^2}_{LCM}$.

Find the lowest possible value of N .

$$A = \underbrace{2 \times 2}_{\text{No Two}} \times \underbrace{5 \times 5}_{\text{No Five}} \times 7$$

$$N = \boxed{\begin{array}{cc} \text{No} & \text{No} \\ \text{Two} & \text{Five} \end{array}} \begin{array}{cc} 3 & 7 \times 7 \end{array} = 3 \times 7 \times 7 = 147$$

$$LCM = \underbrace{2 \times 2}_{\text{No Two}} \times 3 \times \underbrace{5 \times 5}_{\text{No Five}} \times \underbrace{7 \times 7}_{\text{No Seven}}$$

Answer $N = \underline{147}$ [1]